MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

PPS0034 – INTRODUCTION TO PROBABILITY AND STATISTICS

(Foundation in Business)

09 MARCH 2018
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 4 pages with **FOUR** questions.
2. Attempt **ALL** four questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided. All necessary workings **MUST** be shown.
4. **Formulae** are provided at the back of the question paper.
5. **Statistical table** is provided.

Question 1

a) A fair dice has faces numbered 2, 2, 4, 4, 6 and 6. The random variable W represents the score when the white dice is rolled.

i) Write down the probability distribution for W. (2 marks)
ii) Find the value of $E(W)$. (2 marks)

A second dice is black and the random variable B represents the score when the black dice is rolled.

The probability distribution of B is

b	1	3	5
$P(B=b)$	2/3	1/6	1/6

iii) Find $E(B)$. (2 marks)
iv) Find $V(B)$. (3 marks)

Sam invites Farid to play a game with these dice. Sam spins a fair coin with one side labelled 3 and the other side labelled 5. When Farid sees number showing on the coin he then chooses one of the dice and rolls it, If the number showing on the dice is greater than the number showing on the coin, Farid wins, otherwise Sam wins. Farid chooses the dice which gives him the best chance of winning each time when Sam spins the coin.

v) Find the probability that Farid wins the game, stating clearly which dice he should use in each case. (5 marks)

b) Given that continuous random variable X having the probability density function,

$$f(x)=\begin{cases} x^2(2x+k) & 0<x\le 1 \\ 0 & elsewhere \end{cases}$$

i) Find the value of constant k. (4 marks)

ii) Calculate $P\left(\frac{1}{3}<X<\frac{1}{2}\right)$. (3 marks)

iii) Find the mean of X. (4 marks)

(Total = 25 marks)

Continued…

Question 2

a) The probability that a planted radish seed germinates is 0.69. A gardener plants nineteen seeds. Let X denote the number of radish seeds that successfully germinate.

i) What is the probability of 6 to 8 radish seeds that successfully germinate? (4 marks)

ii) What is the probability of not more than 7 radish seeds that successfully germinate? (3 marks)

iii) What is the probability of 2 or less radish seeds that **NOT** successfully germinate? (2 marks)

iv) What is the average number of seeds the gardener could expect to germinate? (1 mark)

b) The deals cracked by an agent per day is a Poisson random variable with standard deviation 3. Given that each day is independent of other day, find the probability of

i) exactly 14 deals cracked per 2 days? (4 marks)

ii) getting less than 3 deals cracked on first day and at most 10 deals to be cracked the next day. (3 marks)

c) Suppose that weights of bags of potato chips coming from a factory follow a normal distribution with mean 12.8 ounces and standard deviation 0.6 ounces.

i) What is the probability of the bags weigh between 10.5 ounces and 13.7 ounces? (4 marks)

ii) If the manufacturer wants to keep the mean at 12.8 ounces but adjust the standard deviation so that only 1% of the bags weigh less than 12 ounces, how small does he/she need to make that standard deviation? (4 marks)

(Total = 25 marks)

Question 3

a) The population shown below is the weight of five pineapples (in kilograms) displayed in a carnival "guess the weight" game booth. You are asked to guess the average weight of the five pineapples by taking a random sample from the population.

Pineapple	A	B	C	D	E
Weight (in kilograms)	1.9	1.4	1.5	1.1	1.0

i) Calculate the population mean, μ. (2 marks)

ii) Obtain the sampling distribution of the sample mean for a sample size of 3. (11 marks)

Continued...

b) Given a test that is normally distributed with a mean of 64 and a standard deviation of 13, find:

i) the probability that a single score drawn at random will be greater than 70. (3 marks)

ii) the probability that a sample of 25 scores will have a mean less than 60. (4 marks)

iii) the probability that the mean of a sample of 16 scores will be more than population mean by at least 12. (5 marks)

(Total = 25 marks)

Question 4

a) The birth weight of babies is normally distribution with a mean of 3.8 kg. A researcher claims that the weight of babies from mothers who smoked a lot during pregnancy will be lower than the population mean. To examine this, he takes a random sample of 36 babies from mothers who smoked a lot. The mean birth weight in this group was 3.48 kg with a standard deviation of 0.8 kg.

i) Construct a 96% confidence interval for the mean birth weight of babies from mothers who smoked a lot. (5 marks)

ii) Using the 0.5% significance level, is the claim true? (10 marks)

b) A study was conducted to see if students living off-campus had a grade point average which differed significantly from the university-wide average GPA of 2.65. Extensive records indicate that the standard deviation of the GPA is 0.2. What is your conclusion, if a random sample of 100 off-campus students had a mean GPA of 2.72? The researcher feels that it is reasonable to assume that the population of GPA scores is normally distributed. Test using the 2% significance level. (10 marks)

(Total = 25 marks)

End of page

Formulae:

1.

	Mean	**Variance**
Discrete Random Variable X	$\mu = E(X) = \sum xP(x)$	$Var(X) = E(X^2) - [E(X)]^2$ **where** $E(X^2) = \sum x^2 P(x)$
Continuous Random Variable X	$\mu = E(X) = \int_{-\infty}^{\infty} xf(x)dx$	$Var(X) = E(X^2) - [E(X)]^2$ **where** $E(X^2) = \int_{-\infty}^{\infty} x^2 f(x)dx$

2.

	Formula	**Mean**	**Standard Deviation**
Binomial Probability	$P(x) = \binom{n}{x} p^x q^{n-x}$	$\mu = np$	$\sigma = \sqrt{npq}$
Poisson Probability	$P(x) = \frac{e^{-\lambda} \lambda^x}{x!}$	$\mu = \lambda$	$\sigma = \sqrt{\lambda}$

3. The z value for a value of x: $z = \frac{x - \mu}{\sigma}$

4. The z value for a value of $\bar{x}$: $z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}}$

where $\mu_{\bar{x}} = \mu$ and $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

5. Sampling error = $\bar{x} - \mu$

Non-sampling error = incorrect $\bar{x}$ − correct $\bar{x}$

6. Point estimate of $\mu = \bar{x}$

Margin of error = $\pm 1.96\sigma_{\bar{x}} = \pm 1.96\frac{\sigma}{\sqrt{n}}$ or $= \pm 1.96 s_{\bar{x}} = \pm 1.96\frac{s}{\sqrt{n}}$

7. The $(1-\alpha)100\%$ confidence interval for μ is

$\bar{x} \pm z\sigma_{\bar{x}}$ if σ is known

$\bar{x} \pm z s_{\bar{x}}$ if σ is not known

where $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$ & $s_{\bar{x}} = \frac{s}{\sqrt{n}}$